CLAIMS

1.   A method for producing activated carbon for an electric double layer capacitor electrode characterized in that the method comprises:

an activation step of obtaining an activated carbon by mixing a raw carbon material for activated carbon with an alkali metal hydroxide, and heating the mixture in an inert gas atmosphere;

a deactivation and removal step of deactivating and removing alkali metal contained in the activated carbon; and

a heat treatment step of heating the activated carbon passed through the deactivation and removal step to a temperature higher than 400°C and not higher than the heating temperature in the activation step, in an inert gas atmosphere.

2.   The method according to claim 1, wherein the heating temperature in the heat treatment step is set at a temperature lower than 750°C.

3.   The method according to claims 1 or 2, wherein the alkali metal is deactivated in the deactivation and removal step by reacting the alkali metal with carbon dioxide gas at 200°C or higher, and/or by washing the activated carbon with water.

4.   The method according to any one of claims 1 to 3, wherein the alkali metal hydroxide is potassium hydroxide.

5.   The method according to any one of claims 1 to 4, wherein the raw carbon material for activated carbon is graphitizable carbon.

6.   The method according to claim 5, wherein the graphitizable carbon is petroleum coke.

7.   The method according to claims 5 or 6, wherein the heating temperature in the activation step is set at a temperature higher than 600°C and lower than 800°C.

8.   The method according to any one of claims 1 to 7, further comprising a water washing step of washing the activated carbon passed through the heat treatment step with water.

9.   Activated carbon for an electric double layer capacitor electrode produced by the method according to any one of claims 1 to 8.

10.   Activated carbon for an electric double layer capacitor electrode, having an alkali metal content of less than 100 mass ppm.

11.   Activated carbon for an electric double layer capacitor electrode, having an alkali metal content of less than 100 mass ppm, said activated carbon being produced by the method according to claim 8.

12   Activated carbon for an electric double layer capacitor electrode, characterized in that
when forming an electric double layer capacitor including a pair of electrodes prepared by impregnating a circular electrode having a diameter of 16 mm and a thickness of 0.5 mm and consisting of 80 mass% the activated carbon, 10 mass% Ketjen black and 10 mass% polytetrafluoroethylene with an electrolytic

solution which is propylene carbonate containing 1 mol/L triethylmethylammonium tetrafluoroborate, and including an separator made of cellulose with a thickness of 50 μm arranged between the two electrodes; measuring alternating current impedance of the electric double layer capacitor at 20°C, with an amplitude of 10 mV centered at 0 V and with changing the frequency from 0.1 Hz to 1 MHz; and plotting the impedance on a complex plane, the absolute value ($-Z_{Im}$) of a negative imaginary part monotonically increases as the value of a real part (Z_{Re}) increases, and the impedance has no local maximum point nor local minimum point.

13.   Activated carbon for an electric double layer capacitor electrode, characterized in that an amount of surface functional groups is more than 0.2 mmol/g and less than 2 mmol/g, and an amount of surface carboxyl group is less than 0.1 mmol/g.

14.   The activated carbon for an electric double layer capacitor electrode according to claim 13, wherein
the activated carbon includes microcrystalline carbon having a lamellar crystal structure similar to graphite, and
relationships of the following equations (I) and (II) are satisfied, wherein A [intensity/g] indicates a peak area of a face (002) in the microcrystalline carbon per unit mass of activated carbon, which is determined by an X-ray diffraction method, and S [m^2/g] indicates a specific surface area determined by a nitrogen gas adsorption method.

$$A \times S < 4.0 \times 10^{10} \ [(\text{Intensity/g}) \cdot (\text{m}^2/\text{g})] \quad \text{... (I)}$$
$$1300 \ [\text{m}^2/\text{g}] < S < 2400 \ [\text{m}^2/\text{g}] \quad \text{... (II)}$$

15.   An electric double layer capacitor having a pair of electrodes and an electrolytic solution, characterized in that at least one of the pair of the electrodes includes the activated carbon according to any one of claims 9 to 14.

16.   An electric double layer capacitor having a pair of electrodes and an electrolytic solution, characterized in that

when alternating current impedance of the electric double layer capacitor is measured at 20°C, with an amplitude of 10 mV centered at 0 V and with changing the frequency from 0.1 Hz to 1 MHz, and the impedance is plotted on a complex plane, the absolute value ($-Z_{Im}$) of a negative imaginary part monotonically increases as the value of a real part (Z_{Re}) increases, and the impedance has no local maximum point nor local minimum point.